

## ***Interactive comment on “Analysis of spatial and temporal patterns of on-road NO<sub>2</sub> concentrations in Hong Kong” by Ying Zhu et al.***

**Anonymous Referee #1**

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The manuscript ‘Analysis of spatial and temporal patterns of on-road NO<sub>2</sub> concentrations in Hong Kong’ presents an investigation of the spatial and temporal variability of street level NO<sub>2</sub> concentrations in Hong Kong. Two on road measurement campaigns were performed in 2010 and 2017 which combined both remote sensing LP-DOAS and mobile in-situ CE-DOAS measurements. As the measurements were taken at different time under different conditions, the authors put a big effort on filtering and normalizing the data in order to make these data sets comparable. Details of the filtering and normalizing procedure are presented. The filtered data were used to analyze the long term trend as well as the temporal and spatial characteristic of NO<sub>2</sub>. The authors also show some interesting characteristics, e.g., enhancement of NO<sub>2</sub> levels around shopping area during weekends and increase of NO<sub>2</sub> around metro stations. The manuscript

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is in general well written and the topic is of interest of the general audiences of "Atmospheric Measurement Techniques". However, some clarifications are necessary. I suggest this manuscript for publication after a minor revision.

Specific comment:

As the measurement campaign were only performed in 2010 and 2017 each for a week. Although the authors have put a lot of effort in filtering and normalizing the data, it is difficult to say the measurements are representative for the general condition. I understood that it is difficult to have longer term measurements, but the authors should at least clarify that it is only a short term measurement and avoid using the term ‘representative’. In addition, the measurement campaigns were performed in different seasons of the year and the meteorological conditions could be quite different. Is there any good reason?

Section 3.2.1: The authors present an example of the NO<sub>2</sub> level under congestion condition and concluded that to filter data take 8 s after the vehicle speed below 5km/h. The lag time shown in this case is the combination of accumulation of NO<sub>2</sub> in ambient plus the lag time of the instrument. The lag time of the instrument is fixed and can be measure, while the time of accumulation of NO<sub>2</sub> varies. Clarification is necessary.

Figure 4 caption: Change ‘during stops due to traffic congestion’ to ‘during traffic congestion’.

Section 3.3: Deriving long term trend from 2 weeks of measurements is not very convincing. The authors should state clear the purpose of comparing these short term measurements. The analysis of EPD and LP-DOAS data is variable though.

Figure 6: This plot contains a lot of information already. However, I still would like to know whether it is possible to compare the EPD data measured at the same time when the CE-DOAS was passing by and how’s the correlation in between? The labels in the plots should be larger. The date in the title of each plot is redundant, please remove

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them.

Figure 8: How does the average map calculated for each year? Does it corrected for the diurnal effect? Since the authors described the measurements were taken during the different time of the day which contains the morning and evening rush hours and non-rush-hour at noon, it may lead to a bias in averaging all measurements.

Figure 11: NO<sub>2</sub> concentration measured by the 7 EPD stations are shown on the map as well. But the authors don't describe any results such as the difference between EPD measurements and the coinciding closest on-road measurements, and the NO<sub>2</sub> average changes in these 2 years of EPD stations.

Page 5 line 28: 'a equilibrium state' to 'an equilibrium state'.

Page 12 line 2- 3: Explain why >1 ppb is significant. I suppose this is related to the detection limit of the instrument. Please specify it in the methodology section.

Page 15 line 10: 'primary NO is could be...' is grammatically incorrect. Please revise.

Page 17 line 3: If the traffic load is mostly constant in commercial areas which include most shopping malls on Sunday, why the differential map shows the decrease of NO<sub>2</sub> around shopping malls? A better description is necessary.

Page 18 line 14 and 15: Same as before, explain why >1 ppb is significant.

Page 20 line 20: I couldn't see the causal relationship between the increase amount of private cars and public transport usage with the significant increase of weekend drivers in Hong Kong. The authors should describe it better.

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